Small Business Innovation Research/Small Business Tech Transfer

Space Durability Testing via MISSE-FF of CORIN XLS Polyimide with Increased Flexibility and Tear Resistance, Phase I

Completed Technology Project (2018 - 2019)

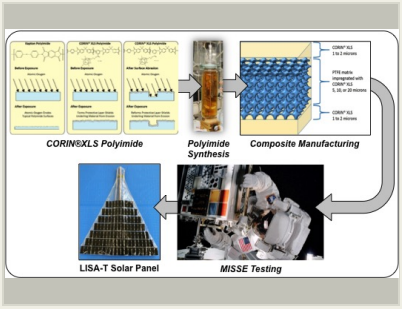
Project Introduction

Thin-film polymers are used in many spacecraft applications including multi-layer insulation and sunshields for thermal control, lightweight structural members in solar array blankets, inflatable/deployable structures, solar sail material for propulsion, as well as flexible solar array backplanes. Materials on exterior spacecraft surfaces are subjected to a very harsh environment composed of photon and charged particle radiation, thermal cycling, impacts from Micro-Meteoroid and Orbital Debris (MMOD), and Atomic Oxygen (AO). Many applications that could benefit from using a thin polymer film are restricted from use due to the fact that many currently available materials do not meet durability or packaging requirements. A modification of NeXolve's AO-resistant CORIN® XLS polyimide is proposed that would improve orbit lifetime and provide lightweight and high packaging efficiency alternatives for use in Low Earth Orbit (LEO) and MMOD-prone applications. Modifications would incorporate a flexible matrix into the inherently UV, VUV, and AO resistant material CORIN® XLS polyimide. This will significantly increase material flexibility and tear resistance at thicknesses less than 25 microns and eliminate the need for external protective coatings. Testing and verification using the MISSE-FF materials test platform will provide critical data to ensure survivability and performance of passive samples in the space environment advancing the TRL to level 5. In phase II, CORIN® XLS composite material will be used to fabricate a deployable system with solar cells that can be monitored in flight. The phase II activity will result in flight qualification of the material for use in future NASA applications and advance the TRL to level 7.

Anticipated Benefits

Thin film materials such as Kapton are used in many applications on spacecraft and other light weight deployable structures. Specific examples include multilayer insulation, flexible solar arrays, solar sails, solar concentrators, and many other applications. All of these applications would benefit in from the development and flight qualification of CORIN® XLS composite films. Specific benefits include longer life, thinner lighter structures, and increased tear strength and abrasion resistance.

CORIN® XLS composite materials will benefit a number of non-NASA and commercial applications. There are many applications that require tough thin films for use in harsh environments. The characteristics of CORIN® XLS composite films will be ideal for applications such as aircraft wiring insulation, flex circuits, down hole-drilling sensors, protective coatings for components subjected to ozone cleaning processes.



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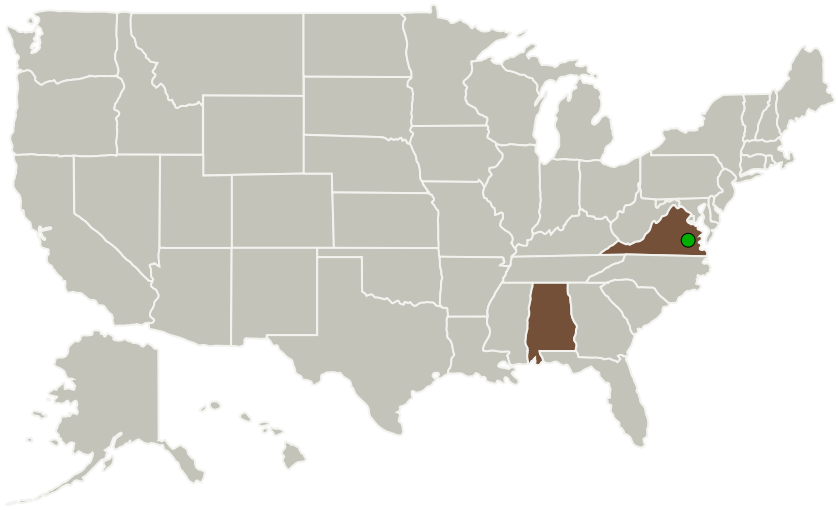
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Nexolve Corporation	Lead Organization	Industry	Huntsville, Alabama
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Alabama	Virginia

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141305)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nexolve Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

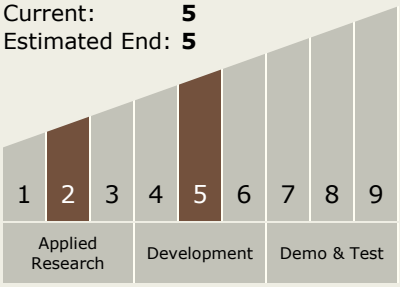
Carlos Torrez

Principal Investigator:

Brandon S Farmer

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



Space Durability Testing via MISSE-FF of CORIN XLS Polyimide with Increased Flexibility and Tear Resistance, Phase I

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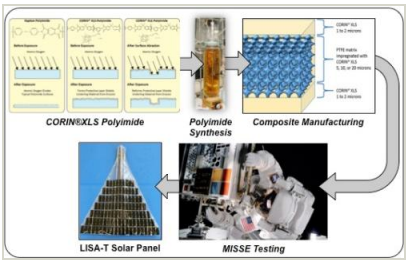
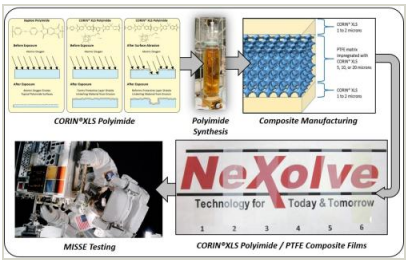
Images



Briefing Chart Image
Space Durability Testing via MISSE-FF of CORIN XLS Polyimide with Increased Flexibility and Tear Resistance, Phase I
(https://techport.nasa.gov/image/134903)



Final Summary Chart Image
Space Durability Testing via MISSE-FF of CORIN XLS Polyimide with Increased Flexibility and Tear Resistance, Phase I
(https://techport.nasa.gov/image/127390)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.1 Lightweight Structural Materials

Target Destination

Earth